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Spaceport News

America's gateway to the universe. Leading the world in preparing and launching missions to Earth and beyond.

John F. Kennedy Space Center

Mission update

STS-99
Shuttle Radar Topography Mission
Target launch date: January (under review)
Launch window: 54 minutes
Target landing date: under review
Mission duration: 11 days
Orbiter: Endeavour, OV-105

STS-101
ISS — Spacehab
Target launch date: No earlier than (NET) March 16, 2000
Launch window: 5-10 minutes
Target landing date: March 27, 2000
Mission duration: 11 days
Orbiter: Atlantis, OV-104

STS-92
ISS —Z-1 Truss, PMA-3
Target launch date: June 14, 2000 (NET)
Launch window: 10 minutes
Mission duration: 10 days
Orbiter: Discovery, OV-103

STS-97
ISS — PV module P6
Target launch date: July 20, 2000 (NET)
Orbiter: Endeavour, OV-105

STS-98
ISS — U.S. Laboratory
Target launch date: Aug. 19, 2000 (NET)
Orbiter: Atlantis, OV-104

STS-102
ISS — Leonardo
Target launch date: Oct. 19, 2000 (NET)
Orbiter: Discovery, OV-103

STS-100
ISS — Raffaello
Target launch date: Nov. 30, 2000 (NET)
Orbiter: Endeavour, OV-105

Bridges unveils KSC 2000

Center Director Roy Bridges offered a "top-level" look at KSC's reorganization plans during a presentation to civil service employees on Dec. 20.

Bridges gave an hour-long, multi-media presentation to civil service employees at the Visitor Complex's Universe Theatre and followed that with a question-and-answer session. The talk also was broadcast live on television throughout KSC.

Bridges said that KSC needs to change its structure to put the workforce in greater alignment with the KSC Roadmap, the Center's long-term operational plan. He added that the new structure points KSC toward its development as a Spaceport Technology Center.

"We are doing rocket science here, and it isn't easy under the best of circumstances," Bridges said. "It's time to look to the future and make some major changes to our organization that will help us do a better job."

KSC formed a core team to develop a plan for reorganization in August. That team pored over existing studies and reports on the Center's structure. In addition, KSC hired outside consultants to analyze the organization and suggest changes.

The announcement marked the second of six "milestones" in the KSC 2000 process. Organizational

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Christmas light

The Space Shuttle Discovery lights up the night sky on Dec. 19 as it rises from Launch Pad 39B. After two consecutive weather scrubs, the launch began the STS-103 mission, devoted to bringing the Hubble Space Telescope back into operation. Please see story, page 5.

KSC mixed progress, nostalgia in 1999

Kennedy Space Center celebrated the 30th Anniversary of the launch of Apollo 11 and man's first footsteps on the moon during 1999. Building on such past successes, the KSC Team during the past year paved the way for treks even farther from home and prepared elements for NASA's new outpost in space.

Astronauts outfitted and prepared that outpost, the International Space Station, for occupancy during a supply mission launched from KSC in May. The Chandra X-ray Observatory was launched in July.

KSC's Dec. 19 launch of Discovery on mission STS-103 set into motion the repair and improvement of the Hubble Space Telescope. The servicing mission will allow the observatory to continue

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Year ...

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providing us with spectacular visions of the cosmos for another decade.

Orbiters launched by the KSC Team propelled 19 crew members into space and carried many major payloads into orbit. In addition, KSC coordinated the launch of nine expendable launch vehicles during the past year.

Seven Shuttle missions are scheduled for 2000. Thirty ELV missions are in development and eight are scheduled for the new year so far.

Preparing for a new millennium of space exploration, KSC provided significant research and development support for work on new space vehicles. The center's leadership also began positioning the spaceport for the future through KSC 2000 reorganization efforts. The reorganization, which will begin early in the new year, is designed to make better use of resources and allow KSC to participate in NASA's cutting edge engineering initiatives, such as the Mars Ascent Vehicle.

KSC will begin the new century with a new area code — 321 — chosen because of the area's 50-year launch history. In honor of the change, Florida Governor Jeb Bush and KSC Director Roy Bridges initiated on Nov. 1 a video teleconference call to KSC's Deputy Director for Business Operations Jim Jennings.

Bridges continued to lead the way in keeping safety and health as the center's No. 1 priority by initiating a series of safety walkdowns, designed to detect and resolve problems that could lead to accidents or failures. KSC again held a centerwide Super Safety Day, one full day devoted to safety awareness and education.

KSC provided significant research and development support for work on new space vehicles during 1999.

Among KSC's other accomplishments during 1999:

Advanced Development and Shuttle Upgrades

Major upgrades to Atlantis, including a "glass cockpit," were unveiled in April. Among 130 modifications made during the 10 months the orbiter was off-line: The replacement of outdated electromechanical cockpit displays with 11 full-color flat panel screens. Other improvements included an Integrated Vehicle Health Management System, which monitors the Shuttle's health while on orbit through a network of high-tech sensors placed throughout the orbiter.

Columbia, the oldest of the four orbiters in NASA's fleet, was sent to Palmdale, Calif., in September for its nine-month overhaul after the Chandra mission. Workers are performing more than 100 modifications on the vehicle.

Shuttle Mission Highlights

Three Shuttle missions were launched in 1999, starting with STS-96 in May. The mission marked the first visit to a new star on our horizon, the International Space Station. Space Shuttle Discovery's international crew of seven spent six days preparing and outfitting the station with 5,000 pounds of cargo. It's now ready for the arrival of its early living quarters — the Russian-built Service Module.

STS-93, launched in July, was the first Space Shuttle mission commanded by a woman, Eileen Collins. Columbia carried the Chandra X-ray Observatory into space. Because of Chandra's ability to detect X-rays, scientists around the world are getting new perspectives on some of the most distant, powerful and dynamic objects in the universe.

The year's final mission, STS-103, was devoted to upgrading and repairing the Hubble Space Telescope. The 9-year-old observatory was shut down temporarily in November when the fourth of its six gyroscopes failed.

The gyroscopes are part of the system that keeps Hubble pointed in the right direction. This servicing mission originally was scheduled for June 2000, but after three of Hubble's six gyroscopes failed, it was split into two separate missions. All three Shuttle missions landed at KSC.

Stardust was one of nine successful Expendable Launch Vehicle missions managed by KSC in 1999.

Expendable Launch Vehicles

As lead center for NASA's acquisition and management of expendable launch vehicle launch services, KSC enjoyed a second successful year.

KSC's Expendable Launch Vehicle team supported many major missions carrying NASA payloads launched from Cape Canaveral Air Station including the Mars Surveyor in January, Stardust spacecraft in February and the Far Ultraviolet Spectroscopic Explorer (FUSE) spacecraft in June.

From Vandenberg Air Force Base in California, the KSC expendable launch team supported the successful launch of the Wide-Field Infrared Explorer (WIRE) spacecraft in March, Landsat 7 in April, the TERRIERS satellite in May, the Quick Scatterometer (QuikSCAT) mission in June and the Terra spacecraft and AcrimSat in December.

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Veteran astronaut Eileen Collins became the first female commander of a NASA mission when she flew the Space Shuttle Columbia in July on the STS-93 mission.

Year ...

(Continued from Page 2)

A contract award to launch the Vegetation Canopy Lidar (VCL) satellite on an Athena I rocket from a launch pad located on Kodiak Island, Alaska, was announced in April. The scheduled launch will be the first to low-Earth orbit from the Alaska Aerospace Development Corporation's new commercial launch facility.

International Space Station

The Italian Space Agency's "Raffaello" Multi-Purpose Logistics Module (MPLM), the second of three Italian modules for the International Space Station, arrived at KSC in August. The reusable logistics carrier was transported to the United States by a special Airbus "Beluga" air cargo plane from the factory of Alenia Aerospazio in Turin, Italy.

The International Space Station truss, which will become the backbone of the orbiting International Space Station (ISS), arrived at KSC in June after having been completed by a division of the Boeing Company in Huntington Beach, Calif.

The Canadian Space Agency's first contribution to the ISS, the 56-foot-long Space Station Remote Manipulator System (SSRMS), was delivered to KSC in May. The arm is the primary means of transferring payloads between the orbiter payload bay and the station for assembly.

A series of Multi-Element Integration Tests (MEIT) on International Space Station components were held during the year to help avoid problems that would be costly to address in space.

Reusable Launch Vehicles

NASA engineering technicians from KSC's Engineering Prototype Lab assisted Orbital Sciences Corporation and NASA's Dryden Flight Research Center in the complex process of converting the X-34 A-1 vehicle from captive carry status to unpowered flight status. The X-34 is a reusable launch vehicle technology demonstrator, and the modified vehicle is now known as A-1A.

A team of Kennedy Space Center experts designed, fabricated and tested the X-33 umbilical system and delivered the finished products to Lockheed Martin in July. Under construction at Lockheed Martin Skunk Works in Palmdale, Calif., X-33 is a half-scale prototype of the planned operational reusable launch vehicle dubbed VentureStar.

Successful tests at the X-33 launch site in January validated a new, laser-guided vehicle positioning system developed by KSC engineers to help Lockheed Martin meet its goal for rapid turnaround of future RLVs between flights.

> Vice President Gore recognized the first year of the Joint Base Operations and Support Contract with the Hammer Award.

Contracts and Facilities

KSC marked its first full year under its Joint Base Operations and Support Contract (J-BOSC). Through J-BOSC, a single set of base operations and support service requirements have been established for KSC, Cape Canaveral Air Station and Patrick Air Force Base. Eighteen different contractors, often with overlapping and duplicate responsibilities, previously performed these services. Vice President Gore recognized the partnership between the KSC and the Air Force with the Hammer Award.

The LC-39 Emergency Power Plant went online with a grand opening in July. The plant provides the Launch Complex 39 area with increased reliability, doubles power capacity and saves about $770,000 every year in the process. The new control system allows NASA to participate in the Commercial Industrial Load Control program offered by Florida Power & Light (FPL), by using the new plant to reduce KSC's electrical demand on FPL's power grid during peak periods. In turn, FPL charges KSC a lower billing rate, which translates into annual cost savings.

The 14,000-square-foot NASA Technical Records Center opened in September, solving several space issues for NASA and Boeing through an innovative agreement and excellent teamwork. Boeing gained the space it needed to support its new Delta IV program, and NASA gained a new records storage site.

KSC hosted the FIRST Robotics competition in March, giving local high school students a chance to get excited about enginnering.

One of two Kennedy Space Center high-altitude chambers formerly used to test Apollo Program flight hardware was reactivated in February for use in leak testing International Space Station (ISS) pressurized modules.

To better safeguard Space Shuttle assemblies and keep assembly procedures on track, the Vehicle Assembly Building (VAB) is being outfitted with a third stacking area. The new area, in high bay 2, will allow NASA to preassemble stacks and still have room in the VAB to pull a Shuttle back from the pad if severe weather threatens.

Tourist Destination Upgrades

A new entryway to the KSC Visitor Center and several new educational presentations opened in April. The $13 million expansion, which was opened to the public earlier this month, includes a new International Space Station-themed ticket plaza, the new Universe Theater with "Quest for Life," and the Robot Scouts exhibit.

Community Outreach and Education

KSC's contributions through the 1999 Combined Federal Campaign totaled $245,644, greatly exceeding the stated goal of $216,000. Employees responded to the theme: "Those who care, share."

KSC's Director and senior managers met during the annual Community Leaders Breakfast in June with business and government leaders from Brevard County and the State of Florida. They talked about the future plans of America's space program and the economic impact these plans may have in the local community.

Thirteen Brevard County schools received 81 excess contractor computers valued in excess of $90,000 through efforts led by NASA's K-12 Education Services Office at Kennedy Space Center. The Astronaut Memorial Foundation was a strategic partner in the effort. Former USBI employees volunteered to put the computers into working order.

KSC participated in the NASA-wide sponsorship of the Summer High School Apprenticeship Research Program. The program is a mentor-based, eight-week program for underrepresented students with NASA scientists, engineers and other research specialists serving as professional role models.

The FIRST (For Inspiration and Recognition of Science and Technology) robotics competition was hosted at KSC Visitor Center in March through the cooperation of NASA and KSC contractor organizations.

FIRST's goal is to expose students to engineering, help them discover the important connection between classroom lessons and real-world applications and inspire them to want to learn more. Brevard County high schools participating in the regional event included Titusville, Astronaut, Cocoa Beach, Merritt Island, Rockledge and Satellite.

Straight to the point

STS-101 mission specialists Edward Tsang Lu, left and Yuri Ivanovich Malenchenko inspect part of the Russian Strela cargo boom earlier this month at the SPACEHAB facility. They and their five crewmates were taking part in the Crew Equipment Interface Test. The cargo boom will be installed on the International Space Station during STS-101, scheduled to launch no earlier than March 16, 2000.

Mulville to lead NASA operations

NASA Administrator Daniel S. Goldin selected NASA's Chief Engineer, Dr. Daniel R. Mulville, as the space agency's Associate Deputy Administrator, effective January 1, 2000. He replaces General John R. Dailey, who is leaving to head the National Air & Space Museum.

As Associate Deputy Administrator, Mulville will plan, direct and manage the daily operations and reinvention activities of the Agency.

"NASA's Associate Deputy Administrator is my most senior advisor on Agency operations, and I am very pleased that Dan Mulville has agreed to accept this position," Goldin said.

As the Agency's Chief Engineer since 1995, Mulville has been responsible for overall review of the technical readiness and execution of all NASA programs, ensuring that development efforts and mission operations of the agency are conducted on a sound engineering basis.

Prior to Mulville's appointment as Chief Engineer, he was the Director of the Engineering and Quality Management Division in the Office of Safety and Mission Assurance. He was responsible for development of NASA's engineering and quality assurance standards for design and development of spacecraft and aeronautics systems.

KSC 2000 ...

(Continued from Page 1)

Implementation Teams will be assigned soon to help move the process from concept to reality. Bridges said the reorganization will be fully implemented by late March or early April.

"It's a very aggressive schedule," Bridges said. "Please be patient with us."

Bridges said that reviews of KSC's current structure made it clear that there are too many separate offices on the organizational chart. The KSC 2000 organization reduces the number of top-level departments reporting directly to Bridges from more than 20 to approximately 13.

Following the presentation, Bridges estimated that fewer than 20 percent of civil service employees may have different duties as the result of the reorganization. But even for those whose duties don't change, the cultural evolution means it won't be business as usual.

One of the most noticeable changes is the combining of Space Shuttle and International Space Station processing into a single office.

"We believe there are a lot of common problems and processes across human spaceflight," Bridges said. "We already have a lot of common experience across both organizations. ... The common functions can be done more effectively if we put them together."

Another new organization, Spaceport Engineering and Technology, focuses KSC's resources on technology development, an area of increased emphasis in future planning.

"We need to apply all of this knowledge we have in operations to the development of future technologies," Bridges said. The result will give KSC "greater influence over the design of new systems, which can make it easier to process, integrate and test those systems."

The newly created External Affairs office puts emphasis on the goal of making it easier for customers to do business with KSC. In addition to the traditional public affairs functions, the office will handle new business development, customer advocacy and governmental affairs. It includes a joint business office with the Air Force.

The Spaceport Services office incorporates information technology, facilities and other support services.

Bridges listed eight objectives of KSC 2000, and he frequently cited the first two in particular during his presentation: fulfilling our commitments for safe operations of the Shuttle, ISS and ELV programs; and improving application of our operational expertiseto meet current and future program challenges through technology.

Bridges also touched on the subject of new center-wide management boards but said that he doesn't want any more than are "absolutely necessary."

The specifics of the new organization will proceed from the top down. Bridges said that the leaders of the new offices will be announced in early January.

The Center Director emphasized that the reorganization is not a form of downsizing and that no civil service employees will lose their jobs as a result of the changes. He urged employees to concentrate on their current roles.

"There will be many conversations with you over the next several months in many forms," Bridges said. "If we all work together on this, this will be relatively painless and we'll be much better off for having gone through this. ... I hope we all see this as a great opportunity for ourselves and look forward to the next steps."

The Center Director's presentation is available on the KSC 2000 web site at:
http://www-pao.ksc.nasa.gov/kscpao/ksc2000/

Bridges is scheduled to give this presentation again on Jan. 4 for employees who may have missed the first one.

STS-103 scopes out relief for Hubble

If anyone at KSC had forgotten the sight and sounds of a Space Shuttle launch, Discovery offered a stirring reminder.

The orbiter blazed into the night sky on Dec. 19, carrying seven astronauts on STS-103, an eight-day mission to repair the Hubble Space Telescope. The picturesque launch from Pad 39B was the first since the STS-93 mission in July.

The launch culminated a period of intensive work by Shuttle team members at KSC. Having completed a comprehensive examination of Discovery's wiring as part of a fleet-wide inspection process, workers also contended with a dented fuel line late in the processing flow.

KSC teams replaced the damaged liquid hydrogen recirculation line at the pad, completing the unprecedented work ahead of schedule.

The launch marked only the third time that NASA has embarked on a mission that would continue over Christmas. Apollo 8 and Skylab previously spent the holiday orbiting the Earth. In addition, NASA astronauts were aboard the Russian space station Mir twice during the holiday season.

The schedule for STS-103 reflected KSC's response to the needs of its customer. With the recent failure of a fourth gyroscope on the Hubble Space Telescope, the orbiting observatory had been rendered inoperative. Hubble is operated by the Space Telescope Science Institute under the authority of Goddard Space Flight Center.

STS-103 Commander Curtis L. Brown is making his sixth trip into space. The pilot, Scott J. Kelly, was the only member of the crew without previous space flight experience.

The mission specialists consist of three NASA astronauts — Steven L. Smith, C. Michael Foale and John M. Grunsfeld — and two representatives of the European Space Agency, Claude Nicollier and Jean-Francois Clervoy.

Hubble was launched aboard Discovery on April 24, 1990, and deployed during the STS-31 mission. The first servicing mission to the telescope took place in December 1993, with a second servicing in February 1997. Subsequent trips to the telescope are planned for 2001 and 2003.

During nearly 10 years in space, Hubble has taken about 259,000 pictures, observing nearly 13,000 astronomical targets. Astronomers using Hubble data have published more than 2,400 scientific papers.

Circling Earth every 90 minutes, Hubble has traveled about 1.425 billion miles — nearly the distance from Earth to Uranus.

Mission Commander Curt Brown, right, leads the STS-103 crew out of the Operations and Checkout Building on Dec. 19 as they head toward the Space Shuttle Discovery at Launch Pad 39B. Following two days of weather scrubs, the crew finally launched on its mission to the Hubble Space Telescope.

The orbiter Endeavour rolls out to Pad 39A aboard its mobile launcher platform earlier this month in preparation for STS-99.

Next in line — STS-99

It was a welcome sight for KSC employees: Two orbiters perched on their pads at the same time.

Endeavour rolled out from the Vehicle Assembly Building (VAB) to Pad 39A on the morning of Dec. 13, taking its place for the first Space Shuttle launch of 2000. At press time, Shuttle managers were reviewing a launch date in January for STS-99.

KSC workers replaced Endeavour's main engine No. 3 as a precaution during processing in the VAB in early December.

Known as the Shuttle Radar Topography Mission, STS-99 will make the most precise and detailed measurements of the Earth's surface ever attempted.

The mission is an international project spearheaded by the National Imagery and Mapping Agency and NASA, with participation of the German Aerospace Center DLR.

The crew for STS-99 consists of Commander Kevin R. Kregel, Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Gerhard P.J. Thiele and Mamoru Mohri, the latter representing NASDA, the Japanese space agency.

Following STS-99, NASA will embark on a series of missions devoted to the continuing construction of the International Space Station.

Holiday cheer is here

Employees gathered for the annual KSC Christmas Coffee on Dec. 8 at the Visitor Complex's Early Space Exploration Building. Many KSC retirees also were on hand to spread holiday wishes with former co-workers. A chorus from Titusville High School, center, set the mood for the morning.

Terra begins taking the Earth's pulse

With the launch of the Terra spacecraft on Dec. 18, workers from Kennedy Space Center played a vital role in the advent of a new era of earth science for NASA.

KSC conducted launch operations at Vandenberg Air Force Base in California under a contract with Lockheed Martin Astronautics. Terra is a joint project among the United States, Japan and Canada, with the U.S. providing the spacecraft and three instruments developed by NASA field centers.

Terra is the flagship in a 15-year mission (called the Earth Observing System, or EOS) to collect environmental data that will serve as the basis for future scientific investigations about the planet. The results should help answer questions about global changes and the effects of humans on the Earth's complex climate system.

The spacecraft, roughly the size of a small school bus, carries a payload of five state-of-the-art sensors that will provide global observations and scientific understanding of land cover change and global productivity, climate variability and change, natural hazards and atmospheric ozone.

From an altitude of 438 miles, Terra will circle the Earth 16 times a day from pole to pole, crossing the equator at 10:30 a.m., when the view is least obstructed by clouds. Viewing swaths from each pass will be compiled into whole global images. Over time, these global images will enable scientists to understand and explain more clearly the causes and effects of global climate change.

The sensors on Terra will not actively scan the surface but will work much like a camera. Sunlight that is reflected by Earth, and heat that is emitted from Earth, will pass through the apertures of Terra's sensors. This radiant energy will then be focused onto specially designed detectors that are sensitive to selected regions of the electromagnetic spectrum, ranging from visible light to heat. The information produced by these detectors will then be transmitted back to Earth and processed by computers into images that we can interpret.

The measurements taken by Terra cover four basic regions: atmosphere, land, ocean and cryosphere.

NASA's Terra spacecraft, right, is prepared for encapsulation in the rocket faring, left, before its launch on Dec. 18 at Vandenberg Air Force Base, Calif.

The life expectancy of the Terra mission is six years. It will be followed in later years by other EOS spacecraft that take advantage of new developments in remote sensing technologies.

Each of the five sensor systems on Terra has a specific function.

ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) will obtain high-resolution images of the Earth in the visible, near-infrared (VNIR), shortwave-infrared (SWIR) and thermal-infrared (TIR) regions of the spectrum. Unlike the other instruments aboard Terra, ASTER will not collect data continuously but instead will collect an average of eight minutes of data per orbit.

CERES (Clouds and the Earth's Radiant Energy System) consists of two broadband scanning radiometers that will measure the Earth's radiation balance and provide cloud property estimates to assess clouds' roles in radiative fluxes from the surface to the top of the atmosphere. CERES includes two identical, high-precision instruments. One will continue the measurements of two previous missions, while the other will record new data related to the Earth's radiation balance.

MISR (Multi-Angle Imaging Spectroradiometer) is a new type of instrument that will view the Earth with cameras pointed at nine different angles, making it superior to typical satellite instruments that look only straight down, or toward the edge of the planet. As the instrument flies overhead, each region of the Earth's surface is successively imaged by all nine cameras in each of four wavelengths (blue, green, red, and near-infrared).

MODIS (Moderate-Resolution Imaging Spectroradiometer) will view the entire surface of the Earth every 1-2 days, making moderate-resolution observations in 36 spectral bands of land and ocean surface temperature, primary productivity, land surface cover, clouds, aerosols, water vapor, temperature profiles and fires.

MOPITT (Measurements of Pollution in the Troposphere) is an instrument designed to enhance our knowledge of the lower atmosphere and particularly to observe how it interacts with the land and ocean biospheres.

Its specific focus is on the distribution, transport, sources and sinks of carbon monoxide and methane in the troposphere.

The purpose of NASA's Earth Science Enterprise is to understand the total Earth system and the effects of natural and human-induced changes on the global environment. The Office of Earth Science is pioneering the new interdisciplinary field of research called Earth system science, which recognizes the Earth's systems as dynamic and highly interactive.

Flight preparations

Marc Epstein, left, of the U.S. Fish and Wildlife Service, holds a rescued white pelican while fellow ranger Kat Royer fixes a leg band on it before releasing it at the Merritt Island National Wildlife Refuge on Dec. 17. The bird had been flown to Florida after being rescued from a contaminated ditch in Indiana. The pelican, named "Fisheater" by its rescuers, is expected to join a flock of about 30 other white pelicans that are wintering on the refuge. The release area abuts KSC property.

Weather buoys are vital but vulnerable

If you're out fishing in the ocean and see an unconventional-looking buoy with a lot of unusual devices on it bobbing up and down, try to avoid the temptation for a closer look. Your presence could accidentally be detrimental to a vital mission.

The unsung heroes of forecasting the weather for launching of the Space Shuttle are actually silent weather sentinels located offshore in the Atlantic Ocean where no human weather observer can be stationed.

These are the automated weather buoys sending back hourly information critical to the Shuttle weather officer during countdown. In addition, the National Oceanic and Atmospheric Administration's (NOAA) Spaceflight Meteorology Group in Houston counts heavily on this offshore data to generate the forecast for landing, either an unplanned return on launch day or a normal end-of-mission landing.

The data is relayed from the buoys via satellite from their station-keeping positions in the Atlantic. While the closest buoy is only 20 nautical miles offshore from Cape Canaveral, moored in the Gulfstream, another is at a far more distant location 110 nautical miles east-northeast of Cape Canaveral. The buoys are part of a national network of ocean weather buoys operated by the National Data Buoy Center, part of the National Weather Service at NOAA and located at the Stennis Space Center in Mississippi.

The information available to the forecasters is extensive and includes sea water temperature, wave height and period information and the customary weather data — temperature, wind, humidity, barometric pressure and precipitation.

"This data is absolutely essential to us since we have no other way to monitor weather data east of the Cape," said Ed Priselac, Shuttle Weather Officer. "The offshore sea conditions are especially significant in developing our forecast and for predicting conditions for solid rocket booster retrieval operations."

> "This data is absolutely essential to us . . ."
>
> ED PRISELAC,
> SHUTTLE WEATHER OFFICER

This year the buoys were subjected to two severe storms, Hurricane Floyd and Hurricane Irene. On Sept. 15, at the height of Hurricane Floyd, the 110-mile weather buoy went adrift, breaking loose from its mooring in waves 50 feet and higher with 80 mile-per-hour sustained winds and gusts exceeding 100 miles per hour. NASA's solid rocket booster retrieval ship Freedom Star was dispatched and returned the buoy to Port Canaveral.

A new buoy was towed out to sea by the Liberty Star, arriving at its permanent offshore location on Nov. 23.

Also this summer, the 20-nautical mile weather buoy broke loose from its mooring, suffering damage as the result of an apparent collision with a boat. It was returned to Port Canaveral by the U.S. Coast Guard, but because of the extensive damage was immediately replaced with a new weather buoy to minimize the time that weather data from this critical location was unavailable.

Because these buoys are located in good fishing areas, particularly the 20-nautical-mile buoy, fishermen have been known sometimes to tie their boats to the buoys, or even fish off them, not being aware that this affects the accuracy of the data. The buoy itself also can be damaged, particularly if a boat should accidentally run into it, as has happened recently.

Not only are these buoys important to meteorologists, but also to the National Weather Service office in Melbourne. That office routinely issues the official coastal waters forecast from Flagler Beach to Cocoa Beach to Jupiter Inlet. The data from the buoy 20 nautical miles offshore are absolutely critical for making accurate forecasts of wind and seas over the area offshore from Brevard County.

Weather buoys such as this one provide the National Oceanic and Atmospheric Administration and other agencies with crucial information. A buoy off Cape Canaveral recently was damaged by an apparent collision with a boat.

The reports from the buoy of long-period swells, or large swells generated by Atlantic Ocean storms farther offshore, are often tip-offs that rip currents, heavy surf or even coastal flooding may develop.

Mariners and surfers with local knowledge have also developed a knack for making their own forecast by following the hourly buoy reports and observing trends. The fishing industry and other recreational fishing interests also find the information from these weather buoys particularly helpful in estimating the local fishing conditions.

Left alone, these buoys are highly reliable and can remain on station for six to 10 years with only periodic maintenance every two or three years.

The weather reports from the 20-nautical-mile buoy are broadcast hourly on NOAA Weather Radio, heard locally at 162.55 mhz. Information on the National Data Buoy Center's network system of 67 weather buoys can be found on the World Wide Web at **http://ndbc.noaa.gov**, or by dialing the automated "Dial-a-Buoy" system at (228) 688-1948.

John F. Kennedy Space Center

Spaceport News

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